EXECUTIVE SUMMARY

This report evaluates the current and future risks to human health and the environment potentially attributable to activities at Operable Unit 6 (OU 6) on Hill Air Force Base (Hill AFB), Utah. Hill AFB was placed on the National Priorities List in July 1987, which requires a series of remedial investigations (RI) and feasibility studies (FS) to be conducted. The Baseline Risk Assessment (BRA) was conducted under the Federal Facilities Agreement (FFA) between U.S. Environmental Protection Agency (EPA) Region VIII, the Utah Department of Environmental Quality (UDEQ), and the U.S. Air Force (USAF). It is one of nine OUs being investigated under the FFA.

As shown in Figure ES-1, OU 6 includes buildings and adjacent land in the 1900 and 2000 areas, as well as portions of the Craigdale and Farr subdivisions of the City of Riverdale, Utah. The 2000 area, along with buildings in the 2100 and 2200 areas, make up a security area known as the MAMS-2 area (Missile Assembly Maintenance and Storage). The on-Base buildings within OU 6 are mainly occupied and operated by the Silo-Based ICBM Program Office. Other important features within the site are the Waste Asphalt Pit, the Roy Gate Pond, and the off-Base pond.

The results and findings of the OU 6 Remedial Investigation (RI) are presented in the *Draft Final Remedial Investigation Report of Operable Unit 6* (November 1994). The BRA is based on field and laboratory work conducted through October 1994.

ES.1 BRA Objectives and Methodology

The objectives of this risk assessment are to determine the human health and ecological risks associated with OU 6. To achieve these objectives, the following steps were performed: 1) identify and characterize the chemicals of potential concern (COPCs) at the site; 2) conduct an exposure assessment to estimate the magnitude, frequency, duration, and route of possible human and nonhuman exposure to the COPCs; 3) determine the toxicity of exposure to the COPCs; 4) develop numerical values to characterize the risk of carcinogenic and noncarcinogenic effects in human and non-human populations; 5) qualitatively evaluate the potential ecological effects; 6) evaluate uncertainties associated with the BRA; and 7) interpret the findings of the BRA in light of these uncertainties.

ES.2 Chemicals of Potential Concern

EPA guidance (EPA, 1989 and EPA, 1992) stipulates a nine-step data evaluation process to identify chemicals of potential concern (COPCs) and organize the data into a form appropriate for a baseline risk assessment:

1. Gather all data available from the remedial investigation and sort by environmental medium;
2. Evaluate the analytical methods used;
3. Evaluate the quality of the data with respect to sample quantitation limits;
4. Evaluate the quality of the data with respect to qualifiers and codes;
5. Evaluate the quality of the data with respect to blanks;
6. Evaluate tentatively identified compounds;
7. Compare potential site-related contamination with background concentrations;
8. Develop a data set for use in the risk assessment; and

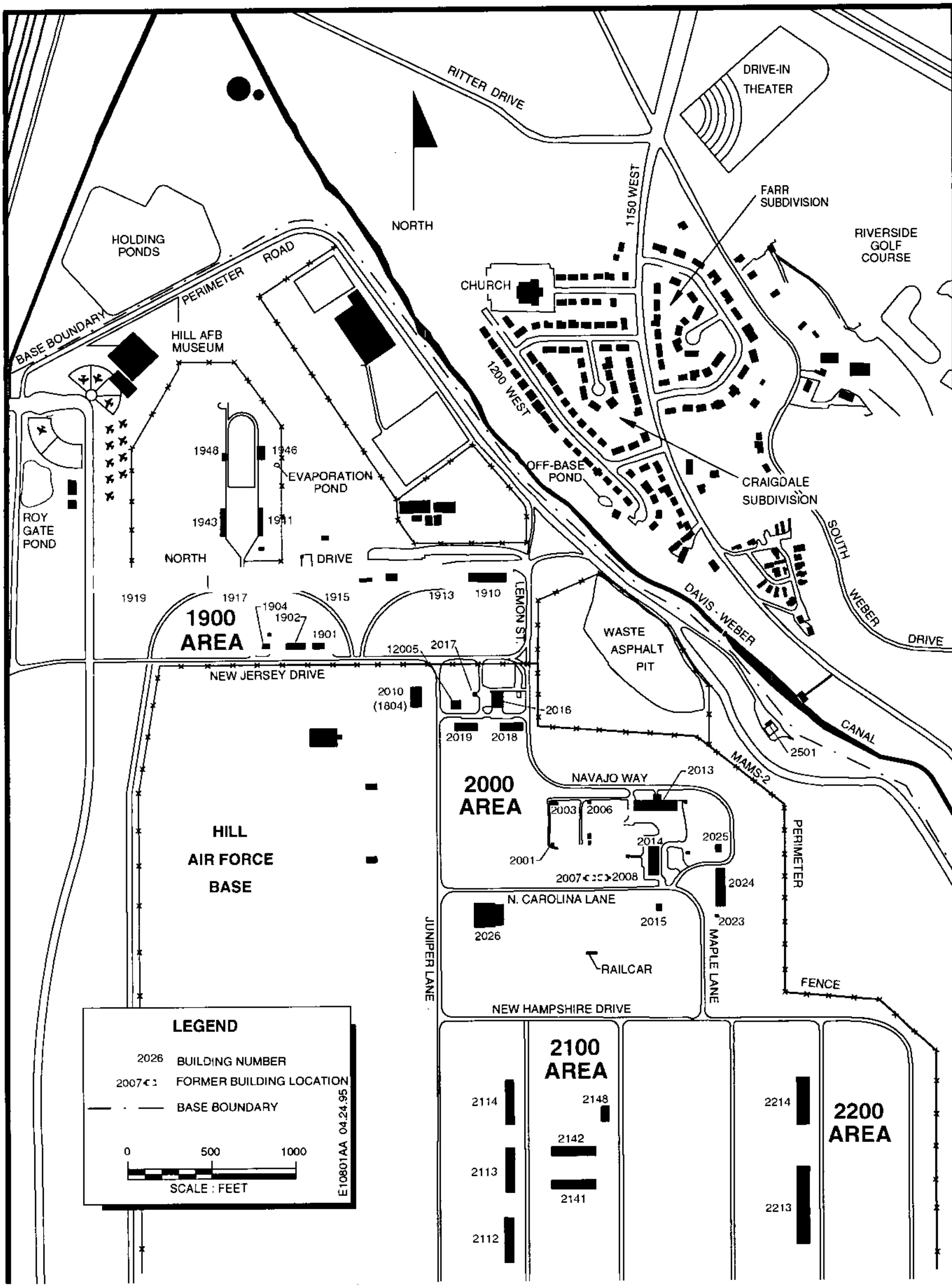

Figure ES-1. Operable Unit 6 Site Map

9. If appropriate, further limit the number of chemicals to be carried through the risk assessment.

Table ES-1 lists the COPCs for human health evaluation that have been identified in the groundwater, surface soils, subsurface soils, Roy Gate Pond surface water, Roy Gate Pond sediments, off-Base pond sediments, off-Base seeps and springs, and indoor air at off-Base locations at OU 6. The RI also included the sampling and analysis of outdoor air in the vicinity of an off-Base spring and the off-Base pond. The data indicate that contaminant concentrations in the ambient air are well below levels that might pose a risk to area residents. Therefore, no COPCs are identified for the outdoor air medium.

COPCs identified for quantitative human health risk assessment include chemicals that were:

1. Positively detected in at least one sample in a given medium;

2. Detected at levels significantly above levels of the same chemicals detected in associated blank samples; and

3. Detected at levels significantly above naturally occurring levels of the same chemicals.

Some chemicals were eliminated from the list of COPCs for human health evaluation if maximum detected concentrations are lower than conservative, media-specific, risk-based screening levels. This procedure identified the chemicals most likely to contribute significantly to the human health risks associated with OU 6 and eliminated chemicals that pose a negligible risk.

Table ES-2 lists the COPCs for ecological evaluation. These include all chemicals with concentrations exceeding blank concentrations in the Roy Gate Pond and blank and background concentrations in off-Base seeps and springs.

Some of the listed COPCs may not be entirely related to waste handling and disposal activities that have occurred at OU 6. The widespread use of pesticides both on and off Base may be responsible for detected concentrations of these chemicals at the site. Some pesticides detected at OU 6 may not occur at the site in levels significantly above those found elsewhere resulting from common land management and agricultural practices. Polycyclic aromatic hydrocarbons (PAHs) are also widespread in the environment and may not be attributable to the site. Concentrations of inorganic chemicals listed as COPCs for the ecological evaluation in Roy Gate Pond water may not be elevated above naturally occurring levels in other similar surface water bodies.

ES.3 Exposure Assessment

Exposure assessment is the determination or estimation of the magnitude, frequency, duration, and route of human and environmental exposures to COPCs present at or migrating from a site. It involves: 1) characterizing the potentially exposed population; 2) developing exposure scenarios; 3) identifying exposure pathways; and 4) quantifying exposures.

ES.3.1 Potentially Exposed Population

For the human health assessment, the BRA evaluated the following five populations to determine potential exposures and consequent health risks:

1. Consumers of beef from locally raised cattle;

2. Off-Base residents in the Craigdale and Farr subdivisions;

3. On-Base workers;

Table ES-1
Chemicals of Potential Concern for Human Health Evaluation

Chemical	Media							
	Groundwater	Surface Soil	Subsurface Soil	Roy Gate Pond Surface Water	Roy Gate Pond Sediments [a]	Off-Base Pond Sediments	Off-Base Seeps and Springs	Indoor Air [b]
Organics								
Aldrin		√						
Benzo(a)anthracene		√		√				
Benzo(a)pyrene		√						
Benzo(b)fluoranthene		√						
alpha-BHC	√			√				
gamma-BHC	√			√				
Chloroform							√	√
Chloromethane				√				
1,1-Dichloroethane								√ [c]
1,1-Dichloroethene	√		√					√ [c]
cis-1,2-Dichloroethene								√ [c]
trans-1,2-Dichloroethene								√ [c]
bis(2-Ethylhexyl)phthalate				√				
Heptachlor epoxide						√		
Indeno(1,2,3-cd)pyrene		√						
2-Methylnaphthalene [d]		√						
PCB-1016		√						
PCB-1260		√	√					
Phenanthrene [d]		√						
Stoddard solvent [e]			√					
1,1,1-Trichloroethane								√
Trichloroethene	√						√	√
Inorganics								
Arsenic						√		
Fluoride	√			√				

[a] No chemicals of potential concern were identified in this medium.
[b] Chemicals of potential concern in indoor air include all chemicals detected in the air sampling program.
[c] Detected in spring enclosure only. Not detected in indoor air of residences.
[d] Retained as a chemical of potential concern for qualitative evaluation only. Toxicity values are not available to perform risk quantification at this time.
[e] This chemical is a tentatively identified compound (TIC) and risks are evaluated separately.

Table ES-2
Chemicals of Potential Concern for Ecological Evaluation

Chemical	Roy Gate Pond Surface Water[a]	Off-Base Seeps and Springs[b]
Organics		
Benzo(a)anthracene	√	
Benzo(k)fluoranthene	√	
alpha-BHC	√	
gamma-BHC	√	
Chloroform		√
Chloromethane	√	
bis(2-Ethylhexyl)phthalate	√	
1,1,1-Trichloroethane		√
Trichloroethene		√
Inorganics		
Aluminum	√	
Barium	√	
Chromium	√	
Copper	√	
Fluoride	√	
Iron	√	
Manganese	√	
Nitrate-Nitrite as N	√	
Selenium	√	
Zinc	√	

[a] Background comparisons were not performed for inorganic chemicals detected in Roy Gate Pond water. A background surface water data set was not available.
[b] A spring feeds the off-Base pond.

4. Hypothetical future on-Base residents; and

5. Hypothetical future on-Base construction workers.

For the environmental analysis, the BRA examined the potential effects on aquatic organisms in the Roy Gate Pond and the off-Base pond (Cooley Pond) and on other area wildlife.

ES.3.2 Exposure Scenarios

To address the range of human exposures that may occur at present and in the future, four chronic and two subchronic exposure scenarios were developed. The four chronic (seven-year to lifetime) exposure scenarios are: 1) present off-Base residents; 2) present on-Base workers (exposures are not expected to change in the future); 3) future off-Base residents; and 4) hypothetical future on-Base residents. The two subchronic (two-week to seven-year) exposure scenarios are: 1) present off-Base consumers of beef from locally raised cattle (considered a subchronic rather than a chronic exposure, assuming that the few area cattle are pastured for only a limited period of three months and then are sold yearly to different buyers); and 2) hypothetical future on-Base construction workers (assuming that construction at the site occurs over a two-year period). Ecological exposures were determined in two exposure scenarios--aquatic organisms in the Roy Gate Pond and the off-Base pond (Cooley Pond) and other area wildlife (qualitative evaluation).

ES.3.3 Exposure Pathways

An exposure pathway describes the course a chemical or physical agent takes from the source to the exposed individual. Figure ES-2 presents a conceptual site model flow diagram for OU 6 and shows the primary sources of contamination, their migration pathways, exposure media, routes, and potential receptors. It indicates the pathways of exposure that are evaluated for each exposure scenario.

ES.3.4 Quantification of Exposures

To quantify exposures, it is necessary to determine or estimate concentrations of COPCs in the exposure media and to estimate chemical intakes for the individual exposure pathways.

Estimation of Exposure Concentrations--Table ES-3 is a matrix of exposure scenarios and exposure pathways quantified in the BRA; it specifies the exposure points and data used to derive concentrations in the exposure media.

Estimation of Chemical Intakes--Exposure is defined as the contact rate of an organism with a chemical or physical agent. Intake is exposure normalized for time and body weight. The BRA used standard equations and assumptions in available EPA guidance to quantify chemical intake.

ES.4 Toxicity Assessment

Toxicity assessment involves determining whether exposure to an agent can increase the incidence of a particular adverse effect (e.g., cancer, birth defects), characterizing the nature and strength of evidence of causation, and if sufficient data are available, quantifying the relationship between the dose of the contaminant and the incidence of adverse health effects in the exposed population. Toxicity values are derived from the quantitative dose-response relationship. These values can be used to estimate the incidence or potential for adverse effects as a function of exposure to the contaminant.

The BRA used only toxicity values that have been developed by EPA. The following sources of information, in order of priority, were consulted to identify toxicity values for COPCs with potential for human exposure.

Figure ES-2. Conceptual Site Model Flow Diagram for OU 6

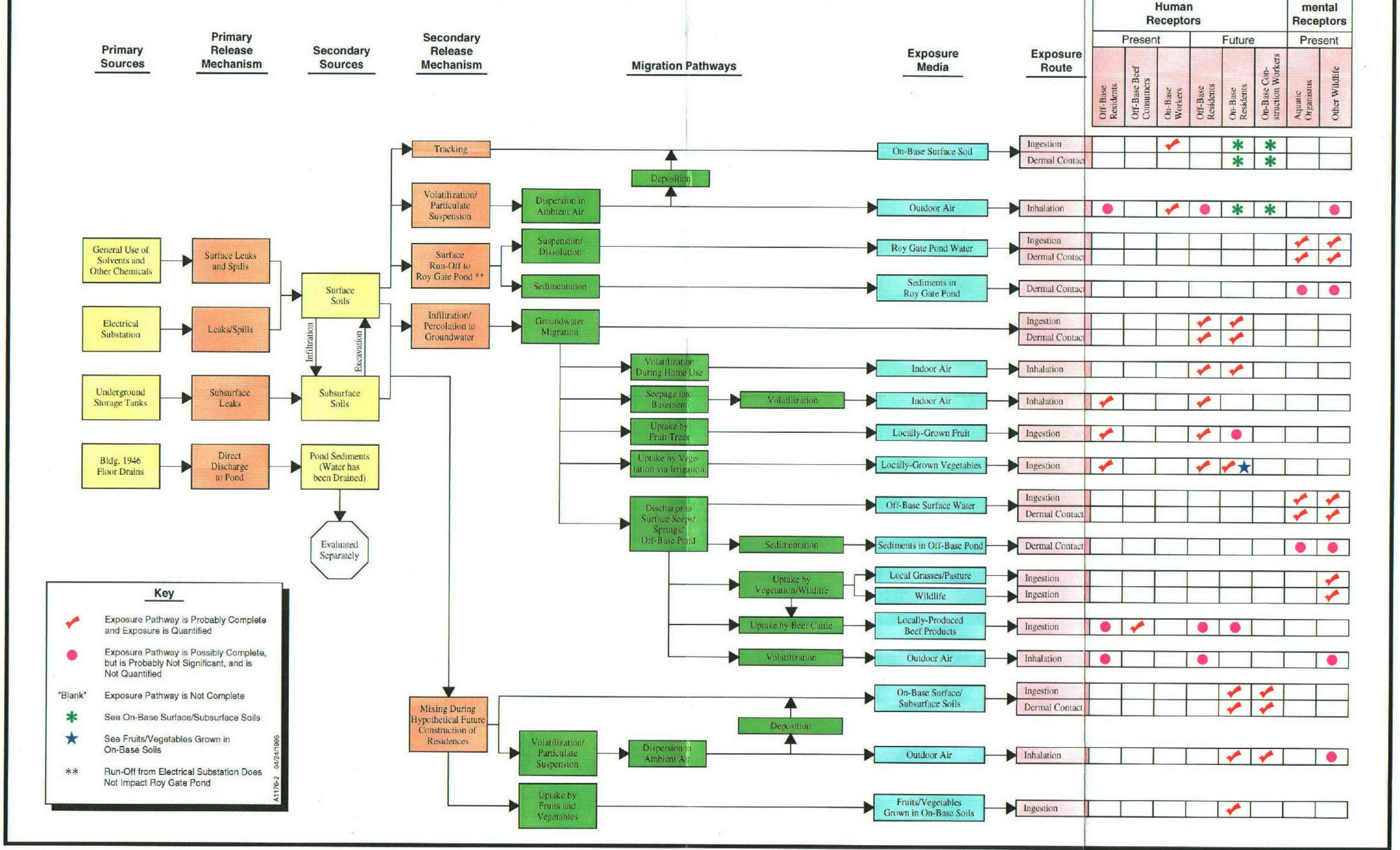

Table ES-3
Exposure Pathways, Exposure Points, and Exposure Media

	Human Exposure						Environmental Exposure	
	Chronic				Subchronic		Chronic	
Exposure Pathway	Present Off-Base Residents	Future Off-Base Residents	Present On-Base Workers	Future On-Base Residents	Present Off-Base Consumers of Beef	Future On-Base Construction Workers	Aquatic Organisms in Roy Gate and Off-Base Ponds	Terrestrial Wildlife
Ingestion of locally produced beef products	NA	NA	NA	NA	Estimated concentrations in beef assuming ingestion by cows of off-Base seep and spring water (B) and pasture grass and soil impacted by this water	NA	NA	NA
Ingestion of locally grown fruit	Estimated concentrations in fruits assuming sub-irrigation with groundwater (A)	Estimated concentrations in fruits assuming sub-irrigation with groundwater (A)	NA	Estimated concentrations in fruits assuming uptake from surface soil (E) and subsurface soil (F), or assuming irrigation with groundwater (A), whichever is higher.	NA	NA	NA	NA
Ingestion of locally grown vegetables	Estimated concentrations in vegetables assuming irrigation with groundwater (A)	Estimated concentrations in vegetables assuming irrigation with groundwater (A)	NA	Estimated concentrations in vegetables assuming uptake from surface soil (E) and subsurface soil (F), or assuming irrigation with groundwater (A), whichever is higher.	NA	NA	NA	NA
Inhalation of volatiles from basement seepage	Measured concentrations in indoor air at off-Base locations (I)	Measured concentrations in indoor air at off-Base locations (I).	NA	NA	NA	NA	NA	NA

Table ES-3
(Continued)

Exposure Pathway	Human Exposure						Environmental Exposure	
	Chronic				Subchronic		Chronic	
	Present Off-Base Residents	Future Off-Base Residents	Present On-Base Workers	Future On-Base Residents	Present Off-Base Consumers of Beef	Future On-Base Construction Workers	Aquatic Organisms in Roy Gate and Off-Base Ponds	Terrestrial Wildlife
Dermal contact with soil	NA	NA	NA	Measured concentrations in on-Base surface soils (E) and subsurface soils (F)	NA	Measured concentrations in on-Base surface soils (E) and subsurface soils (F)	NA	NA
Ingestion of soil	NA	NA	Measured concentrations in on-Base surface soils (E) as dust in offices.	Measured concentrations in on-Base surface soils (E) and subsurface soils (F)	NA	Measured concentrations in on-Base surface soils (E) and subsurface soils (F)	NA	NA
Inhalation of fugitive dust	NA	NA	Estimated concentrations in fugitive dust, based on concentrations in on-Base surface soils (E)	Estimated concentrations in fugitive dust, based on concentrations in on-Base surface soils (E) and subsurface soils (F)	NA	Estimated concentrations in fugitive dust, based on concentrations in on-Base surface soils (E) and subsurface soils (F) and assuming an emission factor for construction activities	NA	NA
Ingestion of shallow groundwater	NA	Measured concentrations in groundwater (A)	NA	Measured concentrations in groundwater (A)	NA	NA	NA	NA
Dermal contact with shallow groundwater	NA	Measured concentrations in groundwater (A)	NA	Measured concentrations in groundwater (A)	NA	NA	NA	NA

Table ES-3
(Continued)

Exposure Pathway	Human Exposure						Environmental Exposure	
	Chronic				Subchronic		Chronic	
	Present Off-Base Residents	Future Off-Base Residents	Present On-Base Workers	Future On-Base Residents	Present Off-Base Consumers of Beef	Future On-Base Construction Workers	Aquatic Organisms in Roy Gate and Off-Base Ponds	Terrestrial Wildlife
Inhalation of volatiles from shower water	NA	Estimated concentrations in shower stall, based on measured concentrations in groundwater (A)	NA	Estimated concentrations in shower stall, based on measured concentrations in groundwater (A)	NA	NA	NA	NA
Ingestion of surface water	NA	NA	NA	NA	NA	NA	Measured concentrations in off-Base pond water (C) and Roy Gate Pond water (D).	Measured concentrations in off-Base seeps and springs (B) and/or pond water (C)
Dermal contact with surface water	NA	NA	NA	NA	NA	NA	Measured concentrations in off-Base pond water (C) and Roy Gate Pond water (D).	Measured concentrations in off-Base seeps and springs (B) or off-Base pond water (C)
Ingestion of vegetation and/or wildlife impacted by shallow groundwater or surface seeps and springs	NA	NA	NA	NA	NA	NA	NA	Estimated concentrations in vegetation and/or wildlife impacted by groundwater (A) or off-Base seeps and springs (B)

Risk Assessment Data Sets

(A) Groundwater
(B) Off-Base seeps and springs
(C) Off-Base (Cooley) pond water
(D) Roy Gate Pond water
(E) On-Base surface soils
(F) On-Base subsurface soils
(G) Roy Gate Pond sediments
(H) Off-Base (Cooley) pond sediments
(I) Indoor air at off-Base locations
NA = Not Applicable

1. EPA's Integrated Risk Information System (IRIS) - IRIS is updated monthly, provides verified toxicity values, and is the agency's preferred source of toxicity information;

2. EPA's Health Effects Assessment Summary Tables (HEAST) - HEAST provides information on interim (not yet verified by EPA Workgroups) as well as verified toxicity values and is used only to obtain values for chemicals not listed in IRIS; and

3. Other EPA documents, such as *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons* (EPA, 1993).

The Superfund Health Risk Technical Support Center was consulted for information on chemicals not listed in IRIS or HEAST.

ES.5 Risk Characterization

Risk characterization involves integrating the possible exposure pathways and estimated chemical intakes with the appropriate toxicity values to form quantitative and qualitative expressions of potential health risk. Estimated exposure levels are compared with chemical-specific toxicity information to determine if current or future levels of contamination, at or near the site, warrant a concern for human health.

Human Health Evaluation--Table ES-4 summarizes by human subpopulation the carcinogenic risks for the exposure scenarios at OU 6. Both average and reasonable maximum risk estimates for the present off-Base beef consumer are below the Superfund site remediation threshold for cancer risk of 10^{-6} (1 in one million). Other scenarios below this risk threshold are the present off-Base resident (adult and age-adjusted averages).

Reasonable maximum cancer risk estimates for the present off-Base resident, average and reasonable maximum estimates for the present on-Base worker and the future on-Base construction worker, and average cancer risk estimates for the future on-Base resident equal or exceed the risk threshold of 1 in one million but are within the Superfund site remediation risk range goal of 10^{-6} (1 in one million) to 10^{-4} (1 in 10,000).

The adult and age-adjusted reasonable maximum risk estimates for one scenario, the future on-Base resident, exceed the high end of the Superfund site remediation risk range goal.

Table ES-5 lists the pathways and contaminants estimated to exceed the 1 in one million risk threshold.

Table ES-6 summarizes the estimated noncarcinogenic hazard indices. None of the current or future scenarios exhibit indices that exceed the Superfund site remediation goal of 1 for noncarcinogens.

Figure ES-3 illustrates the chemical-specific and pathway-specific cancer and noncancer risks for the scenario with the highest estimated risks - the Future On-Base Residential Age-adjusted Child (reasonable maximum) scenario.

Risks of exposure to "unidentified organic compounds," assumed to be associated with stoddard solvent because of its use at OU 6 in the past, were evaluated separately from the more definitively identified chemicals. Although the "unidentified organic compounds" were detected in subsurface soils only at depths of from 14 to 18 feet, estimates of risk for the hypothetical future on-Base residents assumed these soils would be brought to the surface during excavations for the basements and foundations of houses. Generally, excavations for homes go no deeper than 10 feet.

Table ES-4
Summary of Carcinogenic Risks[a] by Exposure Scenario

Scenario	Age-Adjusted[b] Average	Age-Adjusted[b] Reasonable Maximum	Adult Average	Adult Reasonable Maximum
Present				
Off-Base Residents	6E-07	**4E-06**	4E-07	**4E-06**
Off-Base Beef Consumers	5E-11	4E-10	2E-11	2E-10
On-Base Workers	NA	NA	**2E-06**	**1E-05**
Future				
Off-Base Residents	**2E-05**	**8E-05**	**1E-05**	**1E-04**
On-Base Residents	**1E-04**	**8E-04**	**4E-05**	**6E-04**
On-Base Construction Workers	NA	NA	**1E-06**	**2E-05**

NOTE: Risk estimates printed in bold type equal or exceed the Superfund site remediation threshold of 10^{-6} (1 in one million) for carcinogens.

NA = Not Applicable

[a] Carcinogenic risk is expressed as a unitless probability of an individual developing cancer.
[b] For residential exposure scenarios, risks were estimated for an individual whose exposure begins at birth and extends for nine years (average case) or 30 years (reasonable maximum case).

Table ES-5
Chemicals and Pathways that Contribute Cancer Risks
Greater than 1 in One Million

Groundwater Pathways	Soil Pathways
Possible Current Exposures	
Chloroform - inhalation of basement air	**PCB-1260** - ingestion of indoor dust on site
Hypothetical Future Exposures	
Trichloroethene - ingestion of shallow groundwater as drinking water - inhalation of vapors while showering - dermal contact with shallow groundwater used for showering/bathing **1,1,-Dichloroethene** - ingestion of shallow groundwater as drinking water - inhalation of vapors while showering - dermal contact with shallow groundwater used for showering/bathing	**PCB-1260** - dermal contact with soil at residence and construction site - ingestion of soil at residence and construction site - ingestion of fruit and vegetables grown in on-Base soil **Benzo(a)pyrene** - dermal contact with soil - ingestion of soil - ingestion of fruit and vegetables grown in on-Base soil **Aldrin** - dermal contact with soil **1,1-Dichloroethene** - ingestion of fruit and vegetables grown in on-Base soil - dermal contact with soil

Table ES-6
Summary of Noncarcinogenic Hazard Indices [a] by Exposure Scenario [b]

Scenario	Child		Adult	
	Average	Reasonable Maximum	Average	Reasonable Maximum
Present				
Off-Base Residents	0.02	0.04	0.005	0.01
Off-Base Beef Consumers	0.0000004	0.000003	0.0000002	0.000001
On-Base Workers	NA	NA	0.0002	0.0003
Future				
Off-Base Residents	0.7	0.7	0.2	0.3
On-Base Residents	0.7	0.8	0.2	0.3
On-Base Construction Workers	NA	NA	0.0003	0.007

NOTE: Hazard Indices for all scenarios are below the Superfund site remediation goal of 1 for noncarcinogens.

NA = Not Applicable

[a] Noncarcinogenic risk is not expressed as a probability of an adverse effect but rather a comparison between exposure and a reference dose (Hazard Index).

[b] The hazard indices presented in this table do not include hazard quotients for stoddard solvent, which were calculated separately (see Section 7.4).

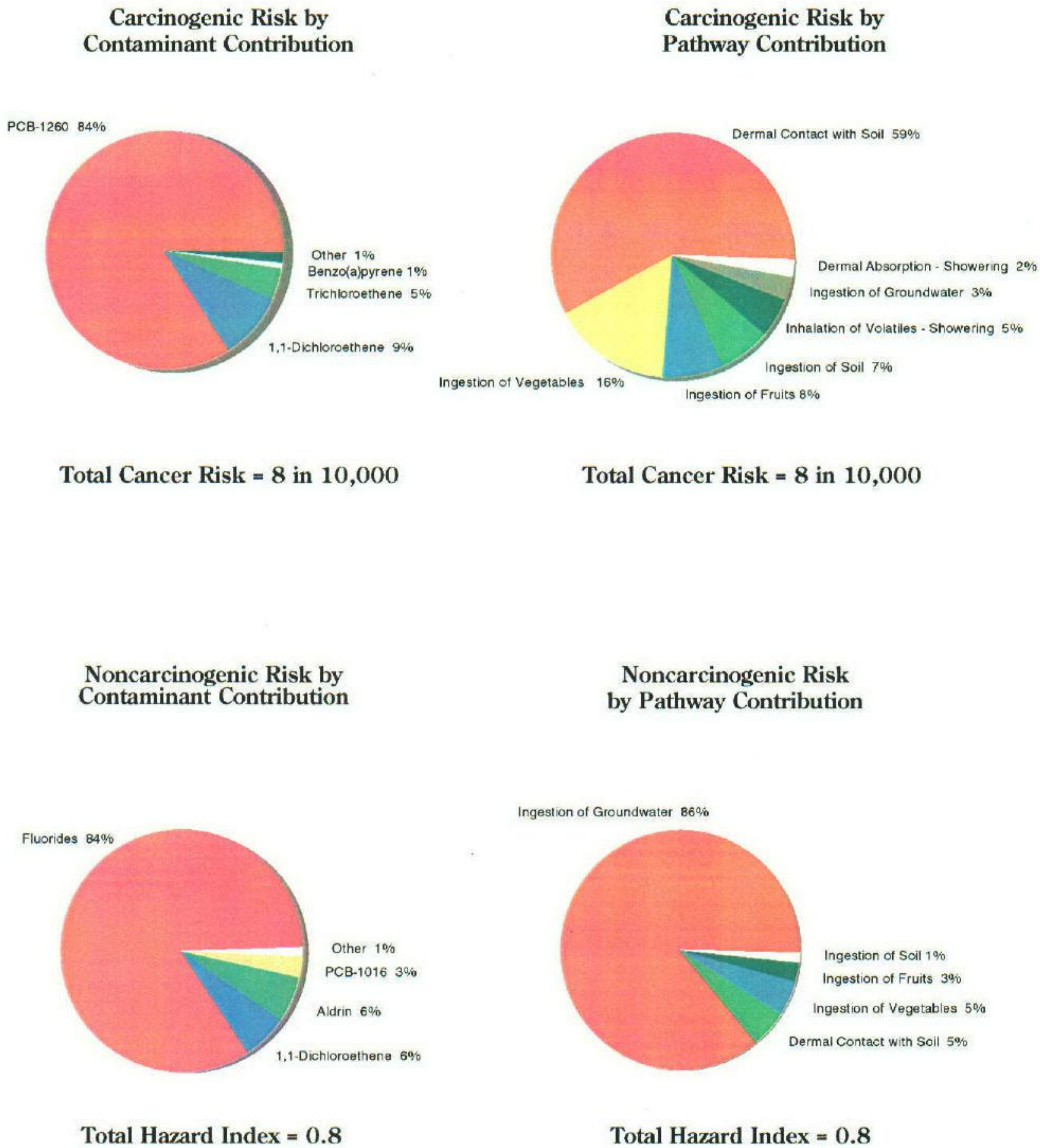

Figure ES-3
Chemical- and Pathway-Specific Cancer and Noncancer Risks for the Future On-Base Residential Age-Adjusted/Child (Reasonable Maximum) Scenario

The estimated hazard index for residential exposure to stoddard solvent, assuming ingestion of, direct contact with, inhalation of fugitive dust from, and growth of fruits and vegetables in, the contaminated soils, ranges from 0.4 (average) to 1 (reasonable maximum) for an adult, and from 3 (average) to 6 (reasonable maximum) for a child. The hazard indices for child exposure exceed the Superfund site remediation goal of 1 for noncarcinogens.

ES.6 Environmental Evaluation

No areas at OU 6 have been classified as a critical habitat for endangered species; currently, no threatened or endangered species are full-time residents of Hill AFB. Although no threatened or endangered species reside on-Base, two endangered species (bald eagles and peregrine falcons) reside nearby.

The environmental evaluation addresses the potential effects of site-related contaminants on aquatic species in the Roy Gate Pond and the off-Base pond and provides a qualitative discussion of the potential effects on terrestrial species using off-Base seeps and springs and/or the off-Base pond as a source of drinking water, and on species (including bald eagles and peregrine falcons) that might feed on these terrestrial and aquatic species.

The qualitative evaluation of the potential adverse effects of contamination from OU 6 on critical habitats and endangered species in the area, and other area wildlife, indicates that deleterious effects from the site contaminants are not likely.

ES.7 Interpretation of Results

The inhalation of basement air containing chloroform in off-Base areas and the ingestion of indoor dust containing PCB-1260 in on-Base buildings are the only potential current exposures associated with cancer risk in excess of 1 in one million. Possible future exposures associated with cancer risk in excess of 1 in one million include domestic use of shallow groundwater containing trichloroethene and 1,1-dichloroethene and dermal contact with, and ingestion of, soils containing PCB-1260, benzo(a)pyrene, aldrin, and 1,1-dichloroethene. The ingestion of fruit and vegetables that uptake PCB-1260, benzo(a)pyrene, and 1,1-dichloroethene also contribute a cancer risk greater than 1 in one million for the hypothetical future on-Base resident.

Chloroform in Basement Air

Average VOC levels, including chloroform, in indoor air in the identified plume area were not found to be elevated above levels found in background locations (outside the plume area). Except for chloroform, the VOCs found to be above background levels at specific locations were not at levels sufficient to pose an unacceptable risk. Many sources (i.e., chlorinated drinking water and consumer products containing chloroform), in addition to contaminated shallow groundwater, however, can contribute chloroform to indoor air. Indeed, the concentrations of chloroform in basements sampled at OU 6 were generally below the nationwide background mean for chloroform in indoor air reported in a study conducted by Shah and Singh (1988).

Furthermore, chloroform was not detected in any media on-Base at OU 6 nor in any of the six off-Base test wells, although it was detected at low concentrations in three on-Base background wells and three of five pre-RI surface water seep and spring samples from the off-Base area. These data indicate that occurrences of chloroform in groundwater are scattered and appear unrelated both to the VOC (TCE) plume and detected concentrations in indoor air at off-Base locations.

These data suggest that the residential areas near OU 6 have been minimally affected by the migration of VOCs into basements. The potential source of the widespread chloroform present in indoor air at low levels is unknown.

Chloroform itself has not been associated with past operations at OU 6.

Although chloroform is a degradation product of carbon tetrachloride, the use of carbon tetrachloride was reported in only one building at OU 6 (prior to 1957) and extensive groundwater, surface water, soil, and sediment sampling and analyses conducted during the remedial investigation have resulted in no detections of carbon tetrachloride in any media. Although the possibility exists that chloroform has been contributed to the site by activities at OU 6, the weight of evidence indicates that chloroform probably results from sources other than the Base.

PCB-1260 in Surface Soils/Indoor Dust

Concentrations of PCB-1260 in indoor dust were assumed to equal concentrations detected in the surface soil at the site. Since the extent of PCB-1260 contamination is limited to a fairly small area, this assumption probably over-estimates the concentration of PCB-1260 in indoor dust in nearby buildings (there is only one building in the vicinity of the PCB contamination). Although the extent of contamination is limited, the risk estimates indicate that residences should not be constructed at the site unless direct contact with the PCB-contaminated soils is prevented or the soils are remediated.

Benzo(a)pyrene and Other PAHs in Soils

Polycyclic aromatic hydrocarbons (PAHs) are widespread in the environment. It is not certain that PAHs detected at OU 6 were contributed by site-related activities. Benzo(a)pyrene was detected in only two out of twelve surface soil samples at OU 6. Other PAHs were detected at the same or lower frequency. The occurrence of PAHs in soils at the site is sporadic; exposure and the consequent health risk from contact with PAHs in the soils is probably much lower than that estimated in this assessment.

Aldrin and Other Pesticides

It is not known that pesticides were disposed of at the site; therefore, the pesticides detected at OU 6 are more probably associated with area-wide agricultural or land management practices rather than with waste disposal activities. Concentrations of pesticides at OU 6 are lower than or the same order of magnitude as concentrations detailed at other OUs and elsewhere in the United States (see discussion in Section 9). Aldrin was detected in only two of twelve surface soil samples at OU 6.

1,1-Dichloroethene in Subsurface Soil

1,1-Dichloroethene is detected in subsurface soils only at depths below 10 feet. Since excavations for home basements and foundations generally go no deeper than 10 feet, it is unlikely that a hypothetical future on-Base resident or construction worker will come into direct contact with soils contaminated with 1,1-dichloroethene. If excavations do encounter soils containing 1,1-dichloroethene, it will probably volatilize and disperse in the ambient air before significant soil contact or inhalation exposure can occur. The risks associated with exposure to 1,1-dichloroethene in the soil from the ingestion of and dermal contact with 1,1-dichloroethene in soil and uptake by fruits and vegetables grown in the soil are probably overestimated.

Trichloroethene and 1,1-Dichloroethene in Groundwater

Concentrations of trichloroethene and 1,1-dichloroethene detected in the shallow groundwater pose a cancer risk in the range of 1 to 10 in 100,000 if the water is used for drinking and other in-home uses. Note, however, that the slope factor used to estimate cancer risk from exposure to trichloroethene is an unverified value that was withdrawn from EPA's toxicity database. Use of this value might overestimate the risk. Use of the shallow groundwater for other purposes, including the irrigation or subirrigation of fruits and vegetables and as stock water for beef cattle, does not pose a significant risk to off-Base residents or to hypothetical future on-Base residents.

ES.8 Conclusions and Recommendations

The BRA indicates that site-related contaminants at OU 6 do not currently represent a significant health threat. If the shallow groundwater is used for drinking water and other in-home uses, levels of trichloroethene and 1,1-dichloroethene detected in the groundwater might pose an unacceptable cancer risk. Likewise, if residences are constructed on the site, particularly in the area where PCBs have been detected in surface soils, the levels of PCB-1260, benzo(a)pyrene, aldrin, and 1,1-dichloroethene detected in the surface or subsurface soils might pose an unacceptable risk to residents and construction workers.

The remedial investigation and baseline risk assessment for OU 6 provide sufficient information and analysis to proceed to the feasibility study phase of site investigation/restoration. On the basis of the results of the baseline risk assessment, Hill AFB, in conjunction with U.S. EPA, Region VIII, and State of Utah DEQ, can identify the chemicals that require remediation and devise cleanup strategies protective of the public health.